

Is Preservation of the Adrenal Vein Mandatory in Laparoscopic Adrenal-Sparing Surgery?

N. Roukounakis, MD, S. Dimas, MD, I. Kafetzis, MD, S. Bethanis, MD, N. Gatsoulis, MD,
H. Kostas, MD, V. Kyriakou, MD, S. Michas, MD

ABSTRACT

Background and Objective: Adrenal tissue-sparing or partial adrenalectomy evolved initially for patients with bilateral synchronous adrenal surgical pathology to preserve vital adrenal volume. In the laparoscopic era, the exact criteria for performing such procedures laparoscopically have yet to be defined. Controversy exists regarding the importance of preserving the adrenal vein, main or accessory. The aim of this retrospective study was to present our short series of laparoscopic tissue-sparing adrenalectomies with vein preservation. Our main goal is not to support partial adrenalectomy as an alternative to total (this is already advocated by many surgeons) but to emphasize the vein-preserving technique.

Methods: Seven patients with peripherally located either aldosterone-producing adenomas (4 cases) or myelolipomas (4 cases) underwent laparoscopic lateral partial adrenalectomy. One patient harbored an aldosterone-producing adenoma and a myelolipoma as well. The main adrenal vein was identified and preserved in 6 patients and the accessory vein in one.

Results: No conversion to open adrenalectomy was necessary, and no perioperative morbidity or mortality occurred. Three adenoma patients are normotensive 44, 23, and 20 months postoperatively, while the fourth one's pressure is refractory.

Conclusions: Surprisingly, total adrenalectomies preceded the partial ones, which is controversial compared with other procedures. Laparoscopic lateral partial adrenalectomy is a technically challenging tissue-sparing operation. Meticulous dissection allows preservation of the middle artery and main or accessory vein resulting in a functioning adrenal stump.

Key Words: Adrenalectomy, Laparoscopy, Adrenal vein, Incidentaloma.

INTRODUCTION

Minimally invasive adrenalectomy by the laparoscopic or the retroperitoneal approach has become the gold standard procedure in cases of functioning or nonfunctioning lesions of the adrenal gland since its introduction in 1992.¹ Partial adrenalectomy was introduced by Irvin et al² in 1983 when the open technique was the only option. Walz et al³ included a tissue-sparing endoscopic technique in select patients in his series in 1996. Bilateral synchronous surgical pathology to preserve vital adrenal volume is the absolute indication for partial adrenalectomy. However, cortical-sparing adrenalectomies have been described by several authors for small solitary tumors emphasizing the benefits of the procedure, which is less traumatic and potentially less hazardous to patients, especially in right-sided lesions (avoiding a possible torsion of the right adrenal vein); moreover, preserving adrenal tissue allows total adrenalectomy in cases of future pathology of the contralateral gland.⁴⁻⁶

The potential benefit of partial adrenalectomy is obvious not only in hereditary but also in sporadic diseases as well. Indications for partial adrenalectomy have yet to be defined along with technical aspects, such as the extent of the excision and the preservation or not of the adrenal vein. Preservation of the adrenal vein ensures that the adrenal remnant will drain to the circulation. However, some authors advocate division of the vein but careful preservation of the minor venous plexuses of the retroperitoneal space instead.⁷⁻⁹ In this article, we present a short series of 7 patients in whom partial adrenalectomy was successfully performed without division of the adrenal vein.

METHODS

We retrospectively reviewed patients who underwent a partial adrenalectomy in our department between January 2002 and January 2006. The pathology of the patients

Department of Surgery, "POLYCLINIC" Hospital, Athens, Greece (Drs Roukounakis, Dimas, Kafetzis, Bethanis, Kostas, Kyriakou, Michas), Department of Surgery, General Hospital, Corfou, Greece (Dr Gatsoulis).

Address reprint requests to: N. Roukounakis, MD, 12 Fokeas St., Papagou Attiki 15669, Greece. Telephone: 210 5276275, Fax: 210 6774032, E-mail: nicrouk@ath.forthnet.gr

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reviewed included¹: peripherally located aldosterone-producing adenomas and² peripherally located myelolipomas. There were 5 female and 2 male patients with a median age of 54 years. There were 5 right-sided (all 4 myelolipomas and 1 adenoma) and 3 left-sided (all 3 adenomas) lesions. We performed 4 right partial adrenalectomies and 3 left partial ones. The following data were recorded: patient's age and sex, preoperative diagnosis, final tumor size, intra- and postoperative complications, operation time, final histological diagnosis, and length of postoperative stay. All patients underwent a full endocrine and imaging evaluation. Computed tomography (CT) scans using 5-mm slices were used to assess the location and size of the tumor.

The preferable surgical approach was the lateral transperitoneal laparoscopic procedure, placing the patient in the lateral decubitus position with the affected side up. This approach offers a large working space, easier removal of large tumors, and a facile conversion to open adrenalectomy if necessary. After meticulous examination of the adrenal gland and the visualization of the lesion, the proximity of the lesion to the adrenal vein was assessed and a partial adrenalectomy was decided upon, provided that a 5-mm margin of healthy tissue from the tumor edge would be kept and that the adrenal stump would be at least 20% of the normal gland. The dissection was initiated from the tumor side of the gland. Full mobilization of the gland with a Harmonic scalpel was necessary before dividing the gland with a vascular stapler. The main adrenal vein and artery were preserved in 6 patients and the accessory vein with its corresponding artery in one.

RESULTS

The median preoperative estimation of the size of the lesion was 6.5 cm (range, 3 to 12) for the myelolipomas

and 11 mm (range, 4 to 29) for the aldosterone-producing adenomas. Operating time, blood loss, tumor size, and diagnosis are summarized in **Table 1**. Adequate stump hemostasis was obtained by using the vascular stapler. No conversions to open adrenalectomy were necessary. No perioperative morbidity or mortality occurred. Patient 3 harbored an aldosterone-producing adenoma beside the diagnosed myelolipoma. Median hospital stay was 2 days, and median follow-up was 3.6 years for the myelolipoma patients and 23 months for the patient with aldosterone-producing adenomas. No myelolipomas have recurred. Three of the adenoma patients are normotensive 44, 23, and 20 months postoperatively, while the fourth one's pressure is refractory and is controlled with antihypertensive drugs at present. Histological diagnosis confirmed the preoperative lesions in all patients.

DISCUSSION

Partial laparoscopic adrenalectomy proved a safe operation in 7 patients, resulting in complete removal of the lesion, in cases of hormone-producing adenomas and in cases of nonfunctioning benign incidentalomas. Despite having histological confirmation of removal of the aldosteronoma, one failure to achieve postoperative normotension is attributed to possible cortical hyperplasia, but the patient's aldosterone levels are marginal for the time being.

Aldosterone-producing adenomas are ideal for partial adrenalectomy because the tumor is usually small, solitary, almost always benign, and frequently peripherally located in the outer surface of the cortex of the adrenal gland. During recent years, surgeons and urologists have presented series of patients suffering from aldosteronomas and bilateral pheochromocytomas treated by partial adrenalectomy.^{10–14} Walz et al¹⁵ included 100 partial retroperi-

Table 1.
Patient Characteristics and Operation Data

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 | Patient 5 | Patient 6 | Patient 7 |
|-----------------|-----------|-----------|------------|-----------|-----------|-----------|-----------|
| Age | 43 | 56 | 60 | 58 | 54 | 64 | 35 |
| Sex | F | F | M | F | F | F | M |
| Op time (min) | 130 | 150 | 120 | 150 | 90 | 100 | 85 |
| Blood loss (mL) | <100 | <220 | <100 | <100 | <100 | <100 | <100 |
| Tumor size (mm) | 6 | 12 | 0.5 A/3 M* | 8 | 0.4 | 2.9 | 0.5 |
| Location | R | R | R | R | L | L | L |
| Diagnosis* | M | M | A+M | M | A* | A | A |

*M = Myelolipoma; A = Aldosteronoma.

toneoscopic approaches with comparable results to total adrenalectomies regarding cure rate. A functioning stump of at least one third of the initial adrenal volume should be left in place.¹⁵

Preservation of the adrenal vein has been used during partial adrenalectomy for adenomas, because adequate venous drainage is important to preserve function of the remaining adrenal stump.⁵ Others propose division of the adrenal vein and rely on the retroperitoneal vein plexus for the maintenance of adrenal function.⁷ Adrenal cortical function does not necessarily require an intact vein, but ligation of the vein requires expensive postoperative investigations to confirm that the retroperitoneal plexus is sufficient for drainage and if not, the adrenalectomy is anatomically partial but functionally total. Furthermore, if the vascular stapler is utilized, mobilization of the gland, which is rather compulsory, carries a high risk of destroying the plexus.

We emphasize that preservation of the vein in a partially resected gland results in less congestion compared with congestion in a partially resected gland with ligation of the vein in which drainage relies only on the retroperitoneal plexus. We state that partial adrenalectomy is time sparing and potentially less hazardous compared with total adrenalectomy but not compared with partial adrenalectomy with vein ligation. Exact preoperative knowledge of the anatomical variations of the adrenal vein is of great importance but difficult to obtain, so meticulous dissection at the area of the inferior vena cava, for those that advocate vein ligation, is mandatory and not always fruitful. On the other hand, retroperitoneal plexus preservation can be extremely difficult to preserve, particularly in small glands.

Nonfunctioning, benign tumors of the adrenal gland if conveniently situated are not a contraindication to partial adrenalectomy. In select cases, such as peripherally located, benign and solitary tumors where total excision of the gland is not mandatory, a cortical-sparing technique with preservation of the vein is a promising alternative to total removal of the gland (**Figure 1**). In our experience with more than 40 laparoscopic adrenalectomies, size is becoming less of a problem as the learning curve matures.

Total adrenalectomies preceded the partial ones in our department, which is controversial. Partial adrenalectomy in select cases must be used by surgeons who are capable of performing a total adrenalectomy. We believe that the final decision for partial or total adrenalectomy should be made intraoperatively. Preservation of the adrenal vein may not be compulsory, but potential loss of the contralat-



Figure 1. Tumor topography.

eral gland in the future (in case of a nonfunctioning stump) makes it desirable.

CONCLUSION

Peripherally situated, nonfunctioning, benign tumors of the adrenal gland, where total excision of the gland is not mandatory, can be treated with partial adrenalectomy. Aldosterone-producing adenoma patients are ideal candidates for cortical-sparing adrenalectomy, due to tumor location and size. The vein-preservation technique ensures a functioning stump, provides better hemostasis due to adequate drainage avoiding congestion of the gland, omits a time-consuming and potentially hazardous step of the operation, and finally gland mobilization allows application of a vascular stapler, reducing operation time. The final decision for partial or total adrenalectomy should be made intraoperatively. Preservation of the adrenal vein may not be compulsory, but potential loss of the contralateral gland in the future (in case of a nonfunctioning stump), makes it desirable. Endoscopic total adrenalectomy experience should precede attempts at a partial adrenalectomy.

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